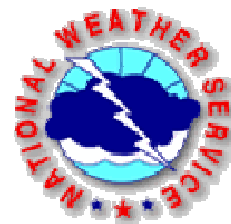




National Weather Service Tucson, Arizona

Coyote Crier

*SKYWARN Newsletter Serving Weather Spotters of
Southeast Arizona*



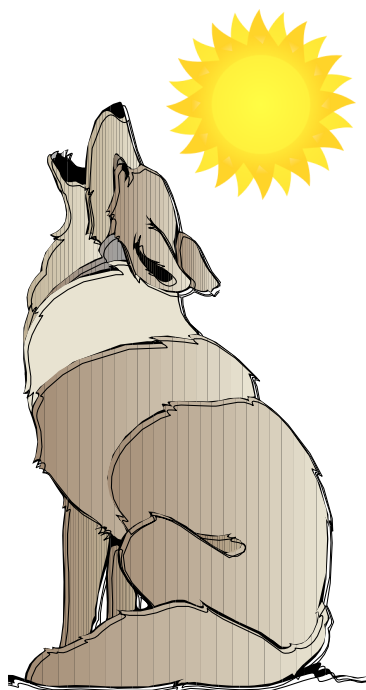
Volume 21, Issue 1

Spring/Summer 2015

National Weather Service is Celebrating 75 Years Serving Tucson and Southeast Arizona

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The U.S. Weather Bureau first opened an office in Tucson on June 17, 1940. Seventy five years later (and a name change to the National Weather Service), we will commemorate this milestone with an open house during 2015. The date of the open house has not been finalized yet, so please check for more information over

the coming weeks on our website:

www.weather.gov/tucson.

Our staff would definitely like the opportunity to meet all of you, reminisce about southeast Arizona weather history, and show off the newest technology we have that will help us to continue to serve southeast Arizona into the future!

*National Weather
Service*

520 N. Park Avenue

Suite #304

Tucson, Arizona 85719

Phone: (520) 670-5156

Fax: (520) 670-5167

Winter 2014-2015

John Glueck, Senior Forecaster and Climate Focal Point



The precipitation forecast for meteorological winter 2014-15, issued by the Climate Prediction Center in November for southeast Arizona, called for enhanced probabilities for above normal precipitation. The reasoning was due to the potential formation of El Niño conditions in the Pacific Ocean. Winter precipitation totals ranged widely across southeast Arizona with some locations recording amounts that were over 2" above normal while other locales recorded amounts that were over 2" below normal. (see table next page)

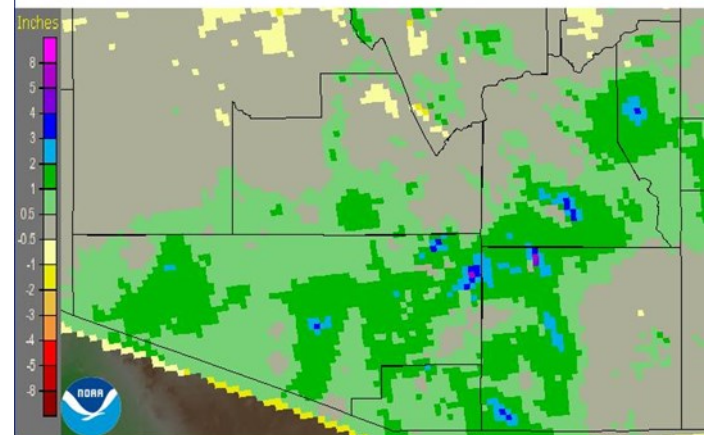
December was rather active with 3 winter storms moving through the state. Most of southeast Arizona recorded above normal precipitation (green and blue). The exception (yellow areas) was across Santa Cruz county, the southern half of Cochise county and in the White mountains of northern Greenlee county.

Tucson, AZ (TWC): December, 2014 Monthly Departure from Normal Precipitation
Valid at 1/1/2015 1200 UTC- Created 1/21/15 7:18 UTC



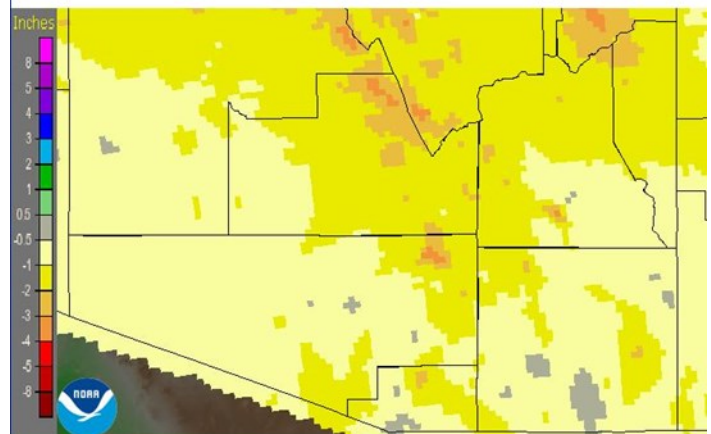
January was more active than December as 5 winter storms impacted the area. Almost all of southeast Arizona recorded above normal precipitation. The exception was across Santa Cruz county, the southern half of Cochise county and in the White mountains of northern Greenlee county.

Tucson, AZ (TWC): January, 2015 Monthly Departure from Normal Precipitation
Valid at 2/1/2015 1200 UTC- Created 2/3/15 22:04 UTC

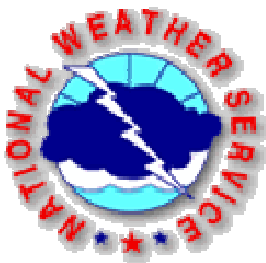


The storm track during **February** migrated north which resulted in the entire area recording below normal precipitation. Pinal and most of Graham and Greenlee counties recorded well below normal precipitation.

Tucson, AZ (TWC): February, 2015 Monthly Departure from Normal Precipitation
Valid at 3/1/2015 1200 UTC- Created 3/11/15 23:43 UTC



"January was more active than December as 5 winter storms impacted the area"



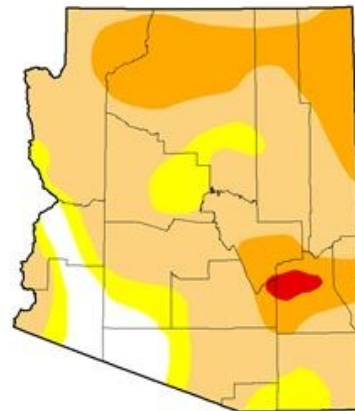
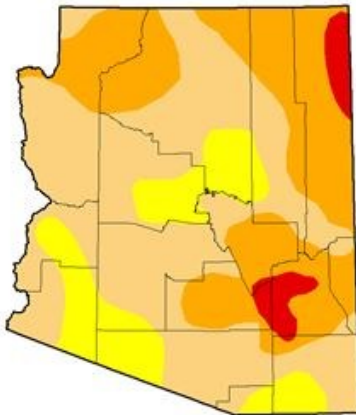
Winter 2014-2015

John Glueck, Senior Forecaster and Climate Focal Point

Precipitation totals across southeast Arizona for Winter 2014-2015

Location	Winter Precipitation	Normal	Departure
Tucson airport	5.12"	2.73"	+ 2.39"
Arivaca	3.36"	4.21"	- 0.85"
Kitt Peak	6.11"	5.97"	+ 0.14"
Ajo	2.67"	2.35"	+ 0.32"
Organ Pipe Cactus Natl Monument	3.33"	3.01"	+ 0.32"
Oracle	4.47"	7.07"	- 2.60"
San Manuel	3.85"	3.56"	+ 0.29"
Picacho	4.94"	3.43"	+ 1.51"
Kearny	2.60"	4.74"	- 2.14"
Nogales	3.00"	3.65"	- 0.65"
Patagonia	2.63"	3.97"	- 1.34"
Fort Thomas	2.72"	3.09"	- 0.37"
Safford	2.97"	2.38"	+ 0.49"
Duncan	3.32"	3.00"	+ 0.32"
Benson	3.72"	2.44"	+ 1.28"
Willcox	4.49"	3.27"	+ 1.22"
Bisbee	3.76"	4.19"	- 0.43"
Sierra Vista	2.64"	2.71"	- 0.07"
Tombstone	4.14"	2.83"	+ 1.31"
San Simon	1.83"	2.84"	- 1.01"
Douglas	1.40"	2.36"	- 0.96"
Coronado National Memorial	5.74"	5.47"	+ 0.27"
Chiricahua National Monument	3.92"	4.89"	- 0.97"

Due to the winter rains there were some reduction of drought conditions across parts of SE Arizona.



Arizona Drought Status on November 25, 2014

Arizona Drought Status on March 3, 2015

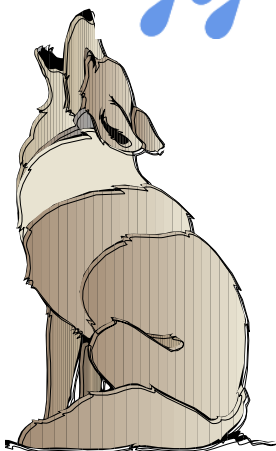
2015 Summer Outlook

By John Brost, Science and Operations Officer

GET THE INFORMATION
YOU NEED...24 HOURS A
DAY...GET A NOAA
WEATHER RADIO!



**"Certain large scale
atmospheric or oceanic
circulations (like El
Niño Southern
Oscillation) provide
some guidance, but the
Monsoon is a fickle
beast"**



It is that time of year again. The spring winds and warm, dry air are bringing cracked knuckles, the first sun-burns of the year, and hay fever.

The first few months of the year were not too bad. Sure, January, February and March were warmer than normal, but we also experienced greater than normal rainfall (Image 1) in many locations. The evidence can be seen in the beautiful desert bloom and the increase in sales of Benadryl.

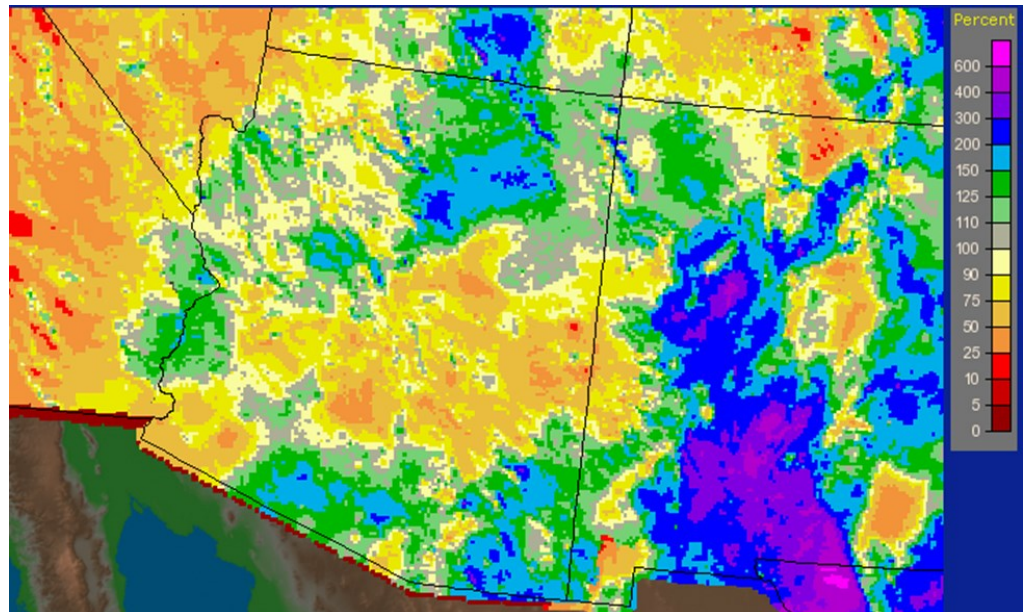


Image 1: Percent of Average Precipitation for January 25th, 2015 through March 25th, 2015.

Now that we transition into the climatological driest part of the year, the big question is, "when is it going to rain?"

Well, it is always difficult to predict the first rain drop of the Monsoon three months ahead of time. We all know the official start of the Monsoon is June 15th, but that hardly means the rain will begin at your house on that day. So what else do we have to go on? Unfortunately, not much at this point. Certain large scale atmospheric or oceanic circulations (like El Niño Southern Oscillation) provide some guidance, but the Monsoon is a fickle beast. For instance, El Niño usually means a wet winter in Arizona, but this is not always the case during the Monsoon.

Let's hold off on El Niño for one second while I introduce you to the Atlantic Multidecadal Oscillation (AMO) and the Pacific Decadal Oscillation (PDO). Just like the El Niño Southern Oscillation, the AMO and PDO can have both a positive and negative phase (although we do not give them a new name like "El

Niño" for the positive phase and "La Niña" in the negative phase. Maybe we should? Send your suggestions too...just kidding.)

What are the AMO and PDO? Well, with the AMO, we are monitoring the sea surface temperatures of the north Atlantic Ocean. As for the PDO, we are monitoring sea surface temperatures in the Pacific Ocean. When these water temperatures are warmer (colder) than normal, we call that a positive (negative) phase. The biggest difference between AMO/PDO and El Niño/La Niña is the time frame. El Niño is measure on the order of months, while AMO is measure in multiple decades and PDO on a decade scale. So these circulations take longer to transition to one phase or another.

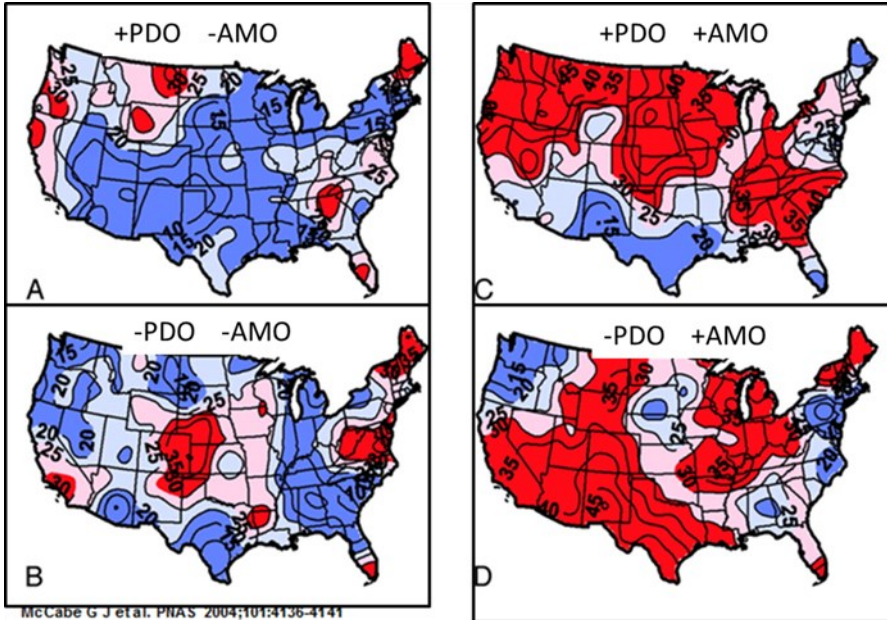
Back in 2004, a study was completed that correlated the combined phases of the AMO and PDO with frequency of drought. Image 2 on the top of page 5 demonstrates the various relationships. The red colors on the map show areas that experience a higher frequency of drought given the com-

bined AMO and PDO pattern while the blue areas show regions where the frequency of drought is low. In other words, red usually implies drier than normal and blue hints at a better shot for wetter than normal conditions.

So how is 2015 shaping up? Well, we have been in a warm phase of AMO since about the mid 1990's, while the PDO was in a negative phase for much of the 2000's but recently moved into a positive phase. Based on Image 2, that means most of the 2000's were in category "D" which suggested an increased frequency of drought across Arizona. However, we are now trending more toward category "C" which sees the higher likelihood of drought shift to the northern United States with drought being less favored in Arizona.

2015 Summer Outlook

By John Brost, Science and Operations Officer



Combination of AMO and PDO and their association with drought frequency.

If you love rain, then your best option is to be in category "A" or "B", but that is going to require a big shift in the AMO. Either way, if you prefer wetter conditions, our recent change in PDO is a good sign.

Now back to El Niño. We officially moved into El Niño conditions in March (this month). As I mentioned earlier, El Niño does not necessarily mean we are in store for a wet Monsoon. In fact, some of our driest Monsoons on record occurred during El Niño years.

So when all else fails, look to the experts at the Climate Prediction Center. This is the Climate Prediction Centers temperature outlook for July, August and September (combined).

Image 3 is showing a 40% chance of being warmer than average this Monsoon. Keep in mind that leaves a 60% chance of either being near average or even cooler than average. Honestly though, I wouldn't bet on anything other than warmer

than average.

Precipitation is always more difficult to forecast than temperatures. Part of reason for that is the number of observations is limited with precipitation. We can monitor temperatures nonstop but we only observe rainfall when it actually rains. In the desert, those events can be few and far between. Thus, it is more difficult to draw conclusions on how a certain atmospheric or oceanic circulation might influence precipitation patterns especially on smaller scales like a city, or a neighborhood. We can draw some conclusions on larger scales such as "the southwest", but we often see wide varieties of rainfall amounts at the smaller scale here in southeast Arizona. That being said, here is the precipitation outlook from the Climate Prediction Center for July, August and September in image 4. This is "good news" if you want rain. The Climate Prediction Center, through a combination of the climate signals we discussed earlier and their climate computer models, has identified a signal that suggests the Southwest U.S. has slightly higher chances of being wetter than average. What I can tell you from a few years of Monsoon experience is that this likely means some locations in Arizona will be "big winners" with abundant rainfall, while others may end up on the drier side.

Remember, it is never too early to start planning for the Monsoon. One way or another the rain will come and you will likely see at least a few heavy rain events. Clean out your rain gutters, plan for a power outage, and take the time now to prepare for our Monsoon. Then, enjoy the most amazing light show of anywhere on Earth.

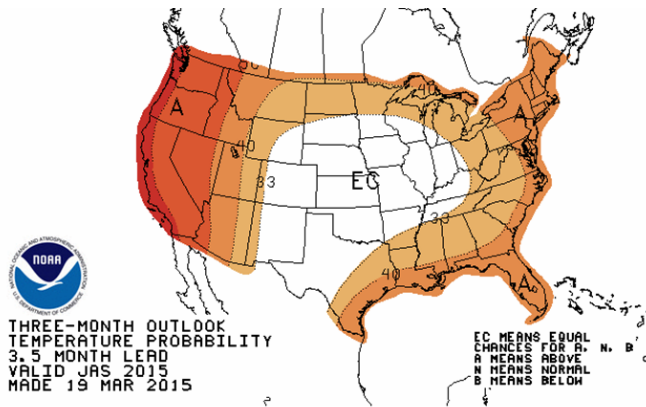


Image 3: Temperature Probability for July, August and September

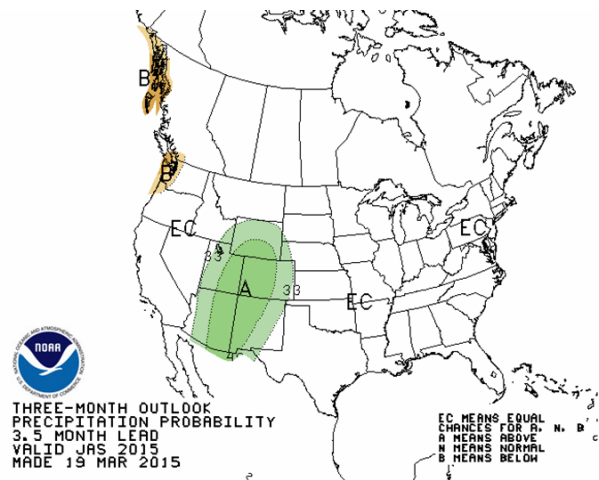


Image 4: Precipitation Probability for July, August and September

Super Bowl XLIX and the NWS What's the Connection?

By Carl Cerniglia, General Forecaster and Incident Meteorologist



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"NWS provided critical weather support to many functions surrounding Super Bowl XLIX and various other high profile events in the Phoenix area"



The connection, the NWS provided critical weather support to many functions surrounding Super Bowl XLIX and various other high profile events in the Phoenix area.

Early this year the NWS, as an organization and myself as an Incident Meteorologist (IMET), had the unique opportunity of providing weather support to a variety of partners responsible for making sure that hundreds of thousands of people had a safe and pleasant experience at four very large events in the Phoenix area. These events included the Pro Bowl, the Super Bowl, the NFL Experience and the Waste Management Open – PGA Golf Tournament, which were held from January 25th through February 1st. Any one of these events would have posed significant logistical challenges for those responsible for public safety, but having all four occur in the same week in the same metropolitan area really raised the bar on several levels.

Starting at the beginning, the NWS was contacted by the FAA and a variety of partners in the Emergency Management community in 2014 requesting that enhanced weather support be included in their operations. As the

planning progressed at the local and regional level, it became apparent that the NWS would have to serve several different needs that would require a commitment that was beyond the capability of the local Weather Service Forecast Office in Phoenix.

The structure that was decided upon was to have the NWS Regional Headquarters as the top level, coordinating resources and offering logistical support as needed. The Phoenix forecast office was the next level and would be the primary provider of forecast information by coordinating with surrounding offices (Tucson, Flagstaff and Las Vegas) and forecasters in the field. Beside the basic forecast package, they also provided a daily suite of graphical products for the on-site forecasters to use. In addition to the typical staff on hand, the manager from the NWS Las Vegas office was brought into the Phoenix office to act as the Event Coordinator. He was responsible for coordinating all the efforts to meet the daily needs of the forecasters in the field and the partner groups we were serving. He was chosen for

this position as a result of his experience gained by the Las Vegas office spearheading this type of support for a variety of large events in and around Vegas.

This brings us to the final level, the forecasters dispatched in the field directly working with our partners, myself included. Overall there were five of us, four in the Phoenix metro area and one stationed in Las Vegas. Why Vegas you ask? One of the groups that requested enhanced weather support was the FAA due to the significant air traffic that was expected, on the order of more than double the normal volume. As a result, a forecaster from the Phoenix office was stationed at the air traffic control center from January 21st, ahead of the Pro Bowl, through February 3rd to support their operations and planning. The Las Vegas airport is the primary backup to the Phoenix airport in the event that weather poses problems; therefore a forecaster from the Las Vegas NWS office was located at the Vegas airport tower. This was planned well in advance and at that time no one realized how important that decision was as weather resulted in significant problems the week before the event and dense fog the morning of the Super Bowl closed the Phoenix airport for several hours resulting in many aircraft being diverted to Vegas. Thankfully, our FAA partners were made aware of these issues ahead of time and were kept informed by the forecasters on site to mitigate the impacts of the weather. The city of Glendale was the host city for the Pro Bowl and Super Bowl and, in cooperation with several Federal Agencies, was responsible for security and emergency services before and during both games. As a result, they activated an Emergency Operations Center (EOC) which is basically one large room in a secure facility where representatives from each agency work together, coordinating with each other to provide a safe environment and respond to any emergencies that arise. The



A briefing just before the Super Bowl at the Glendale EOC

Super Bowl XLIX and the NWS What's the Connection?

By Carl Cerniglia, General Forecaster and Incident Meteorologist

variety of agencies represented was amazing and ranged from local public works department officials up through high level federal agencies, all working together in one room for a common goal.

I represented the NWS in Glendale from January 23rd through February 2nd providing forecasts as well as a variety of briefings, especially on game days. These forecasts and briefings were used to help mitigate impacts to the thousands of construction workers around the stadium, the tens of thousands of people attending concerts around the stadium as well as security around the area. During the week, the shifts were generally 8-10 hours in length while game days they were 14-16 hours long.

One small example of support occurred the Wednesday before the Super Bowl where I briefed local officials on a rain storm that would affect the area Thursday through Saturday. One concern was for the large outdoor concerts scheduled Thursday and Friday

evenings where the concerts and parking areas were on nothing more than large grass fields subject to runoff and mud problems. After informing them of the amount of rain expected and when it would occur, they took a variety of actions to mitigate issues with the mud including having backup tow trucks if needed. Those tow trucks were necessary as dozens of vehicles ended up stuck in the mud, but it would have been far worse without other actions having been taken thanks to the detailed information provided to them. During the Super Bowl I was briefing a variety of agencies on the timing of the fog dissipation, hourly wind forecasts on the ground and aloft and general weather conditions. The rare dense fog event was a major issue around the stadium, affecting security over and around the stadium as well as how fast the paint would dry on the field! It was jokingly mentioned the fog had to be gone before game time so the roof could be open and I

needed to be sure to take care of that.

The other two forecasters were splitting 16 hour days at the MACC, which stands for the Multi-Agency Coordination Center. This large group of agencies from the city to federal level was overseeing the operations across all the events throughout the metro Phoenix area including the Golf tournament, the NFL Experience in Downtown Phoenix, as well as other events related to the games. Basically this was an EOC similar to Glendale on a larger scale. Those two forecasters (one from Phoenix and the other from Las Vegas) provided forecasts and briefings for agencies outside of the City of Glendale and could be used as a backup in case of sickness or if a major event was to occur.

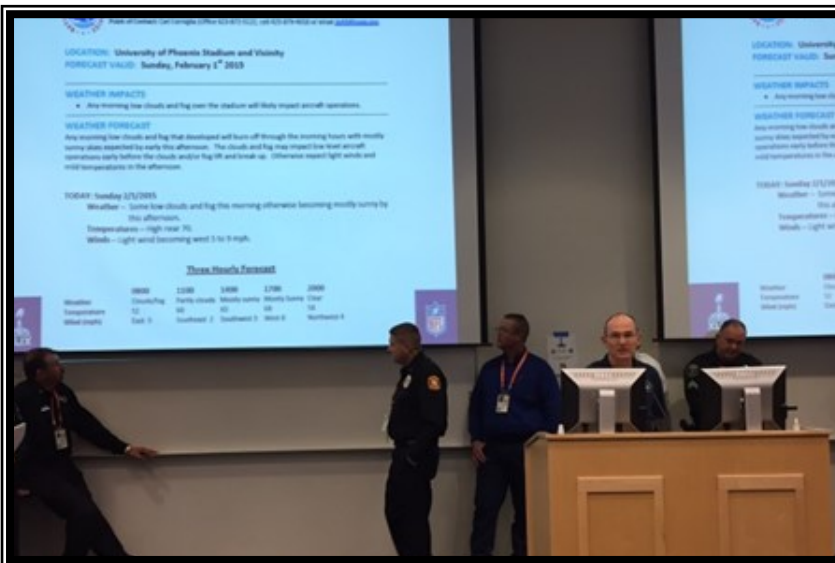
Overall, this was a very interesting and educational assignment for me as well as the agency as a whole. The after action reviews, including the core partners, identified a variety of benefits and strengths as well as areas of potential improvement in our services for

similar events in the future, and will be applied in planning for the 2016 Super Bowl L (50) in Santa Clara, CA. One quote from the Plans Chief in Glendale summed it up well "...please thank all the [people in your organization] that committed to making this happen "the right way". I know that this opened some eyes on our end and from experience, I already (very clearly) knew that what a dedicated professional

[meteorologist] brings to an IMT (Incident Management Team) is immeasurable."



"One of the groups that requested enhanced weather support was the FAA due to the significant air traffic that was expected, on the order of more than double the normal volume"



My early morning briefing at the Glendale EOC



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Monsoon Reporting Reminders

By Emily French, Meteorologist Intern

Here are a few reminders heading into Monsoon 2015, along with example storm reports for your reading enjoyment!

When reporting via Twitter, please tweet us directly using @NWSTucson or include #azwx so that we will see your report quickly.

Please only report heavy rainfall amounts to help with flash flooding. This is generally more than 0.50" in 60 minutes or less. Light/daily rain amounts and/or delayed reports can be reported FREE through CoCoRaHS.org for anyone who has a 4" rain gauge.

Don't be afraid to convey your uncertainty about a report. If you're not sure what you're seeing but believe we should be aware of the situation, please tell us. That kind of information is still valuable to us.

***** Some examples of spotter reports that we at the NWS might receive *****

5:15 pm: "Yes, I am spotter 8765, and I'd like to report 0.07" of precipitation at my house as of 8:00 am this morning." *This report is delayed too long from the time of observation, and the rain amount is too light to be valuable to us for flash flooding purposes. Unnecessary report.*

10:38 am: "Hello? There is a lot of rain and hail falling here right now, and it's really windy. What? Oh I'm on the eastside of Tucson. Where? I'm near Golf Links & Harrison. Wind speed? I'm not sure...maybe 45 mph? Trees are blowing back and forth like crazy! I'm driving so I'm not sure how big the hail is, I just know that a lot of it is hitting my car. It might be the size of marbles. What's my spotter number? I'm not sure. My name is Joe Kerr and I live on Kolb." *This report is too vague and needs more definitive information. The spotter is not prepared to give a report and the call is drawn out too long, especially for a severe weather situation.*

3:27 pm: "Yes hi, this is spotter 126. I'm driving west on I-10 near Picacho close to mile post 215, and I see a lot of dust. Visibility is only about 1/2 mile down the interstate in front of me and it seems to be getting thicker. Cars are moving pretty slowly and the wind is making my car swerve a little bit. If it gets much worse I'm going to need to pull over! Call back if the visibility drops to 1/4 mile or less? You got it!" *This report is very good. The spotter is well-prepared and gives all the necessary information. However, we do not encourage driving and talking on a cell phone.*



"Please only report heavy rainfall amounts to help with flash flooding"



Phone Numbers to call for spotter reports:

1-800-238-3747

or

(520) 670-5162



Monsoon Safety

Although the monsoon brings welcome rains and relief from the summer heat, the thunderstorms that come with the monsoon bring their own hazards. This is the most dangerous time of year weather-wise in Arizona, so before and during the season, it is a very good idea to review these safety tips:

Lightning:

If you hear thunder, you are close enough to a storm to be struck by lightning. Go to a safe place immediately! The safest locations are sturdy buildings and hard-topped vehicles.

Get away from open areas, including armadas, porches, trees, convertible cars, swimming pools, and open areas.

Plan outdoor activities to avoid being outside between mid afternoon and mid evening, especially in higher elevations where lightning is more common.

Do not touch any wires or plumbing inside a building

Remember that it does not have to be raining for you to be struck by lightning. Lightning can strike up to 60 miles away from the nearest rainfall!

Bring pets indoors. Lightning and thunder are very scary for pets, and they are likely to panic or even run away to try and escape the storm.

If someone is struck by lightning, call 911 immediately!

Flash Floods:

Flash floods are common in Arizona. There are thousands of low water crossing and dips which flood every summer. Know where they are, and avoid them during heavy rains.

Never ever drive into a flooded roadway. The water depth is very easy to misjudge, and the road itself may be damaged or destroyed underneath. It only takes about 1 to 2 feet of water to float most vehicles, including SUVs.

Never drive around barricades. They are there for a reason – usually because flash flooding is about to take place, is already happening or the road is damaged by flooding and is unsafe.

Never allow children to play near washes or storm drains after any rainfall, no matter how light. These flood easily and rapidly, and storm drains are usually so large that children can be swept away.

Beware of distant thunderstorms, especially if they're over mountains. Flash flooding can occur many miles away from the thunderstorm as the runoff flows into the valleys and deserts.

Do not camp overnight near streams during the monsoon. Although many of our thunderstorms occur during the afternoon and evening, some of our worst flash floods have occurred in the middle of the night.

Hikers and mountain bikers should try to get out early in the day to avoid the dangers of not only flash flooding, but also lightning. Wherever you are hiking during the monsoon, be aware of your escape routes, follow ranger instructions, and be prepared to move to higher ground quickly.

Dust storms:

These are an underrated killer in Arizona! Straight line winds in any thunderstorm can lift huge clouds of dust and reduce visibilities to near zero in seconds, which can quickly result in deadly, multi-vehicle accidents on roadways.

Dust storms are more common in the early part of the monsoon, near agricultural areas, and near the Willcox Playa in Cochise County. Use caution in these areas any time thunderstorms are nearby.

If you encounter a dust storm, pull off the road immediately. Turn off your headlights and put your vehicle in "PARK," and take your foot off the brake. Other motorists may tend to follow taillights in an attempt to get through the dust storm, and may strike your vehicle from behind.

Dust storms usually last a few minutes, and up to an hour at most. Stay where you are until the dust storm passes.

Straight-line winds:

Thunderstorm wind gusts in Arizona almost always exceed 40 mph. The strongest straight line wind gusts can exceed 100 mph, and can produce damage similar to a tornado! Anytime a thunderstorm approaches, no matter how weak it seems, move indoors to avoid flying debris. Winds rushing down from a thunderstorm can develop very quickly.

When a Severe Thunderstorm Warning is in effect, it means damaging wind gusts of 60 mph or higher are likely. Move into a central interior room. Stay away from windows.

Unanchored mobile homes are NOT safe in any severe thunderstorm, and even anchored mobile homes can be heavily damaged in winds over 80 mph. Move to a more sturdy structure.

Stay away from trees. The vast majority of people are killed or injured in severe thunderstorms by falling trees, from flying debris, or from downed power lines.

Never touch a downed power line, even if it appears dead. Assume that it is live. Call for help instead.

Straight line winds can travel dozens of miles away from the thunderstorm that produced them. If the wind suddenly shifts and blows toward you from an approaching storm, while the temperature either becomes much colder or much hotter, the winds are likely to become even stronger. Move indoors!

Before the monsoon, it is a good idea to either secure loose outdoor furniture and garbage cans, or move them indoors. These are frequently blown around in our summer thunderstorms – even the weakest ones.

Weather Spotter Training Sessions 2015

Date	Time	Location
April 20, 2015	6:30 pm	Graham County Admin Building 921 Thatcher Blvd., Safford, AZ
April 28, 2015	6:30 pm	U of A Campus, ENRB Rm 253 520 N. Park Ave., Tucson, AZ
May 2, 2015	2:00 pm	Oro Valley Public Library 1305 W. Naranja, Oro Valley, AZ
May 4, 2015	6:30 pm	Marana Municipal Complex 11555 W. Civic Center Dr., Marana, AZ
May 11, 2015	6:30 pm	Santa Cruz County Court House 2150 N. Congress Dr., Nogales, AZ
May 12, 2015	6:30 pm	Sahuarita Town Hall Council Chambers 375 Sahuarita Center Way, Sahuarita, AZ
May 21, 2015	6:30 pm	Sierra Vista Police Auditorium 911 N. Coronado Dr., Sierra Vista, AZ

National Weather Service Tucson Office Staff

Meteorologist in Charge.....Mike Cantin

Administrative Support Assistant.....Leslie Cole

Warning Coordination Meteorologist.....Kenneth Drozd

Science and Operations Officer.....John Brost

Service Hydrologist.....Erin Boyle

Electronic Systems Analyst.....Chris Carney

IT Specialist.....Evelyn Bersack

Electronic Technicians.....Rick Leupold, Keith Sapp

Senior Forecasters.....Jeff Davis, Brian Francis, John Glueck, Jim Meyer, Greg Mollere

Forecasters.....Carl Cerniglia, Glenn Lader, Chris Rasmussen, Gary Zell

Meteorologist Interns.....Lee Carlaw, Emily French, Ricardo Humphreys

Observation Program Leader.....Mic Sherwood
